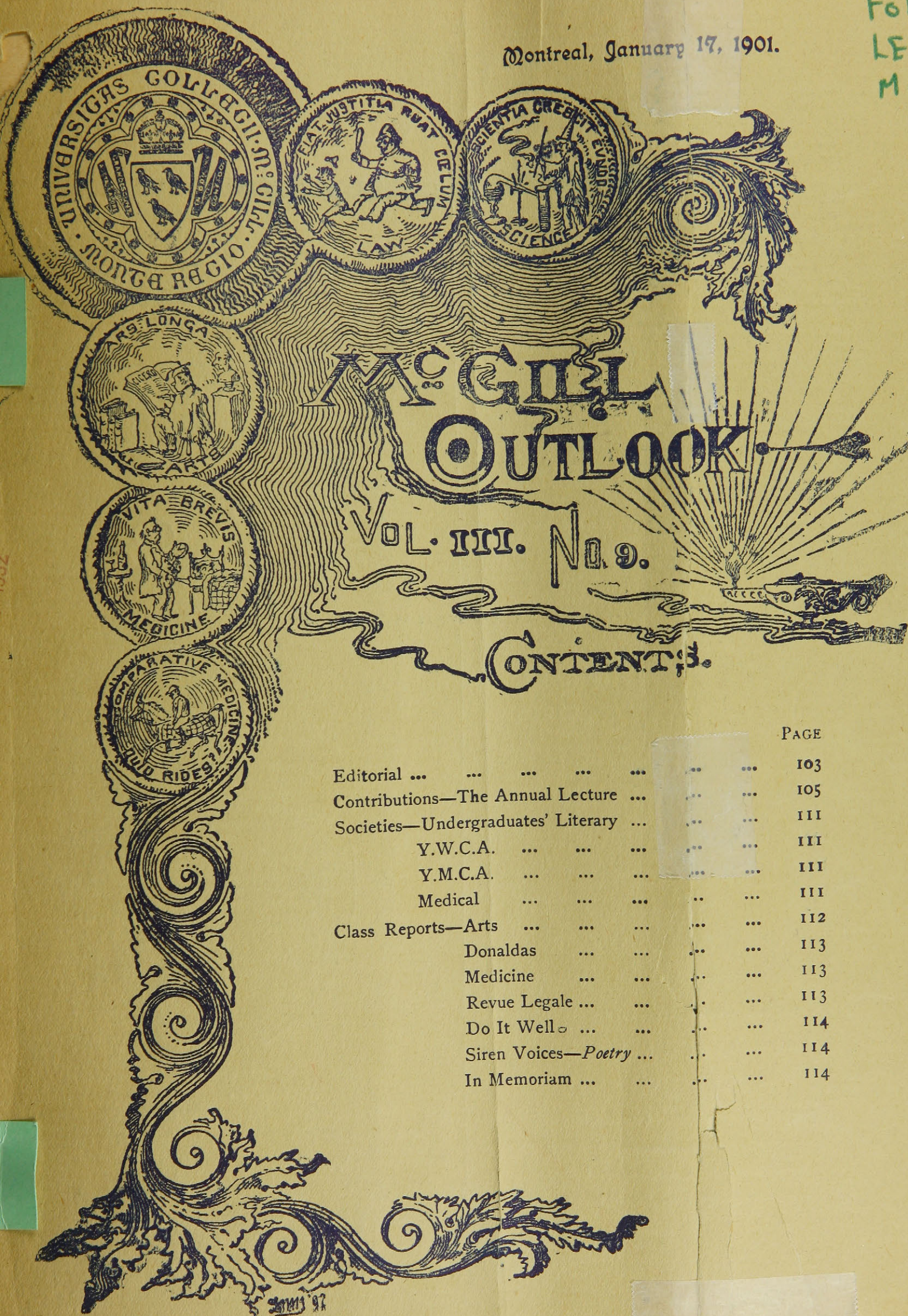


Montreal, January 17, 1901.

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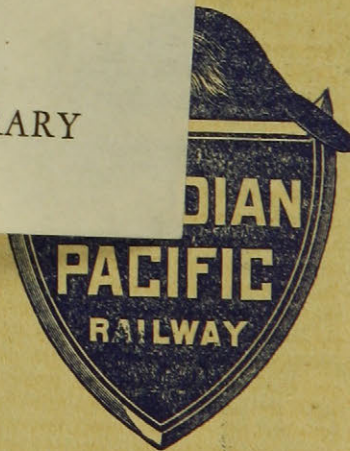
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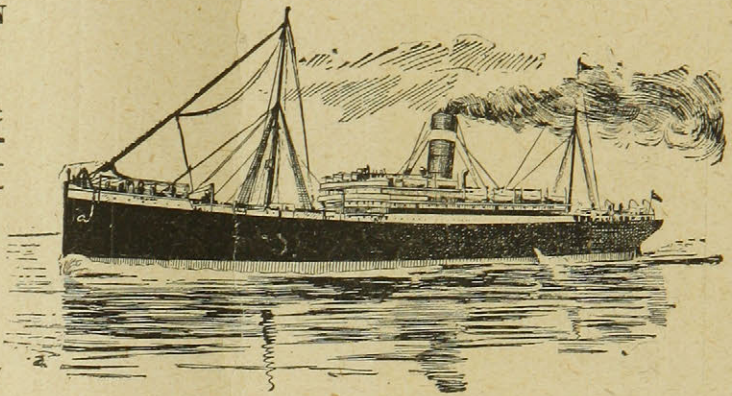
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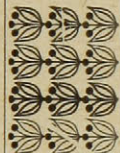
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MONTREAL, JANUARY 17, 1901.

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H. U. P. AYLMER, 26 Ontario Ave.

Editorial.

We wish the readers of the OUTLOOK a very Happy New Year. We modestly refrain from any remarks about the century.

In another column will be found a verbatim report of the University lecture, which was delivered by Dr. Walker in the Molson Hall on Thursday last. Those of us who had the good fortune of being present will look back on the hour spent in the Molson Hall (usually associated with matters far from pleasant) as one full of pleasure or profit. The personality of the Professor, no less than the interesting nature of his subject, made a lasting impression on his hearers. Dr. Walker is certainly a man capable of imparting his enthusiasm to his hearers, and if personal enthusiasm and sincerity count anywhere it is in the work of a professor.

After reading of the progress which has been made in the last century in almost every direction, we cannot let this opportunity pass in the first number of the OUTLOOK for 1901 of

commenting on the vast strides which education has made in Canada, more particularly as associated with the work of our own University of McGill. It was in 1802 that the Royal Institution for the Advancement of Learning was incorporated by Act of Legislature, the object of this body being the furtherance of education in Lower Canada, and it was in 1813 that, by bequest of our honoured founder, the Hon. James McGill, the institution first found means of carrying out its projects—to some limited extent, at least. The original idea was that "McGill College" should form a part of a large Imperial University, the foundation of which had long been discussed. This scheme of an Imperial University, however, fell through, owing to the determined opposition of a certain party in Quebec, and it remained for the Royal Institution to proceed with the independent establishment of a McGill College. A Royal Charter was applied for and granted in 1821, but, owing to unforeseen difficulties, it was 1829 before the College opened. "Commencing

then" (we quote from the Calendar) "the work of teaching with two Faculties, Arts and Medicine, the record of the first thirty years of the University's existence is an unbroken tale of financial embarrassment and administrative difficulties. The charter was cumbrous and unwieldy, and unsuited to a small college in the circumstances of this country, and the University, with the exception of its Medical Faculty, became almost extinct." It might have been expected that in the midst of these difficulties, so pithily referred to in the above lines, the men who guided our University in its early days would have lost heart and thrown up the enterprise; evidently they were made of sterner stuff, for they stood by the University until relief came, about 1850, in the form of renewed interest on the part of the gentlemen of Montreal in the affairs of our University. A new charter was obtained "in 1852, and in 1855, with the advent of a new principal, an era of progress and prosperity began."

As a matter of fact then our University has been in active existence for scarcely fifty years, dating from the time of the new charter, and in this short period, short when we consider how laborious and slow the work of establishing an institution such as a University must necessarily be, she has established an unquestionable right to be called the great University of Canada. If there is ever to be such an institution in our country as that of a National University, surely McGill is pre-eminently fitted to fill the posi-

tion. Other universities may (and probably do) claim the right to be considered as such, but they seem to forget that, if a university is to be truly national, it must be free from the influences of party strife which connection with any particular province brings in its train. McGill stands free of all influence in this respect "the supreme authority," says the Calendar, "if the university is vested in the Crown and is exercised by His Excellency the Governor-General of Canada for the time being. This is a special and important feature of the Constitution, for while it gives the University an Imperial character and removes it at once from any merely local or party influence, it secures the patronage of the head of the political system of the country."

Our facilities for instruction in science are perhaps, unequalled—thanks to the generosity of our benefactors and more particularly to Sir William Macdonald. In Medicine we have our largest and most influential Faculty, while Arts is fast being raised to the high standard of the others. The Engineering Building was opened in 1893, and the Physics' Building in the same year, while the Chemistry and Mining as late as 1898. If then one Faculty, that of Science, has made such progress in less than a decade, surely the limits which its influence and prosperity will reach in the next hundred years are hard to define. And with the prosperity of each individual Faculty the whole University prospers.



Contributions.

THE ANNUAL UNIVERSITY LECTURE.

The annual University lecture at McGill was delivered on Thursday last in the Molson Hall by Professor J. Wallace Walker, M.A., Ph.D., upon "A Century of Chemistry." Dr. Peterson presided, and amongst those present were Mr. John Molson, Deans Johnson, Bovey, Ruttan and Walton, Rev. Principal Hackett, Professors Cox, Harrington, Moyse, McLeod, Chandler, Wesley Mills, Adams, Colby, Carter, Capper, Porter, McBride, Rutherford, Abbott-Smith and Wyatt Johnson, Drs. Gregor and G. R. Parkin, Messrs. Gould, Sanders and Leacock, Miss Oakeley, Miss Cameron, Miss Milhau, Miss Brooks, Miss Dover and Miss Holmstrom.

Dr. Peterson briefly introduced the lecturer who said :

Mr. Vice-Chancellor, Members of Convocation, Students, Ladies and Gentlemen :

Standing as we do, at present, in the portals of a new century, I would ask you to glance back with me for a short time at the achievements of the one which we have now left behind, and compare as concisely as possible the present position of the science, which I have the honour of representing along with my distinguished colleagues in your University, with the position which that science occupied one hundred years ago. The interval has been a time of untiring labor, of boundless research and of far-reaching speculation as in all other departments of human knowledge, although possibly the contrast between it and previous centuries is less marked in chemistry than in several of the other sciences. For the eighteenth century, especially towards its close, was a time when the bud of chemical science, which had been so long maturing, showed evident signs of bursting out into full flower. In fact, the opening year of the nineteenth century saw a great controversy raging among the leading chemists of the day regarding what we still consider as the most important of all the laws of the science. I refer to the law of equivalent weights. On the issue of this controversy hung the fate of chemistry as an exact science. When experiment finally confirmed the law, and the balance was declared to be *par excellence*, the instrument of the chemist, the science took a position second to none in the exactitude with which it could foretell the changes which would ensue when certain conditions were altered ; and a century's work has shown that the degree of exactness with which this forecast can be made depends only on the degree of delicacy attainable in the construction of the instrument. Thus was established one of the grandest of all scientific conceptions—the law of the indestructibility of matter.

CHEMISTRY AS A BLACK ART.

At the commencement of this past century, although the researches and speculations of the natural philosophers of the time were devoted to such simple questions as the chemical composition of water and the nature of combustion, the thick veil of

mysticism, in which for a thousand years the alchemists had delighted to shroud the meaning of their labours, was by no means withdrawn from before the eyes of the ordinary onlookers, and, even at the commencement of the enlightened nineteenth century, students of chemistry were, I fear, looked on by many as followers of the black art and traffickers in magic. This lingering idea had been fostered by the application of many of the chemicals prepared from minerals and plants to the alleviation of human suffering or the untimely removal of undesirable rivals, but still more possibly by the nebulous language of the treatise on the "Hermetic Art," as the "Adepts in Alchemical Philosophy" were pleased to style themselves and their studies. The following quotation is an interesting sample of this obscurity. It is taken from a treatise with the remarkable title of "Analogy in the Process of the Philosophic Work to the Redemption of Man by Jesus Christ." "Venus thirsteth after the manifestation and predominion of the fire of love, but Mercury in the sulphur of Mars and Saturn presseth itself into her with his killing dissolvent, which is the greatest poison of the dark wrathful source ; but Venus, instead of drinking the same down, yieldeth up herself wholly thereinto, as if she actually died. And from hence the great darkness in the philosophical work ariseth, so that the whole matter becometh black as a raven." Few, probably, will recognise under the description the formation of copper sulphide, and none, I am sure, will see the "analogy" or take the following as a description of nitric acid :

"Our mercurial water has such a sympathy with the astrums that, if it is not kept very close and hermetically sealed, it will in a short time, like a winged serpent, fly away in a wonderful manner to its own sphere, carrying along with it all the elements and principles of metals, and not leaving so much as one single drop or the least remainder behind.

"Several pretenders to the magical science prepare magical magnets to draw down from the air, and (as they pretend) from the astrums such menstruums as they think necessary for the production of the great elixir, but their magnets, being compounded of several determinate things, although their menstruums are great solvents, yet we do, on assured knowledge, affirm that they never can perform any real experiment in our art."

HANDMAID OF MEDICINE.

Small cause for wonder that such bombastic and vaporous language, written only a century before, should leave the ordinary uninitiated mind of the year eighteen hundred in a maze of perplexity as to the real objects of chemical science. Among educated people even chemistry was nothing more than pharmacy—the handmaid of medicine—and practically only the scientific world understood that the aim of its devotees was the elucidation of such problems as the nature and causes of the changes which occur

when two dissimilar substances unite to form a new one differing from them both.

The true nature of the simplest and commonest of all chemical phenomena, viz., combustion, had just been discovered, although it was by no means as yet generally accepted, and the discoverer, Lavoisier, who thus became one of the founders of scientific chemistry, had fallen on the scaffold a victim to the hatred of a few jealous rivals, condemned because "the Republic had no need of scientists."

Priestley, the discoverer of oxygen and the founder of the methods for investigating gases, was still alive, but exiled from his English home to one in New England, where, for a year or two, he kept on his old studies—theology and chemistry.

Cavendish, in England, and Berzelius, in Sweden, were engaged in laying the foundations of quantitative analysis by a long series of measurements, which even now, with all our modern equipment, can scarcely be surpassed in accuracy. It was under Berzelius that many of the German leaders in chemical science, during the first half of the past century, received their training, and the description of his laboratory, as given by one of his most distinguished pupils, is not without interest to us here, who are furnished with one of the most magnificent edifices which has ever been dedicated to the study of this science. Wohler says of it: "As Berzelius led me into his laboratory I was as in a dream, doubting if I could really be in the classical place which was the object of my aspirations..... The laboratory consisted of two ordinary rooms furnished in the simplest possible way; there were no furnaces or draught cupboards; neither gas nor water service. In one of the rooms were two common deal tables; on one of these worked Berzelius, the other was for me. On the walls were a few cupboards for the reagents; in the middle was a mercury trough, whilst the glassblower's lamp stood on the hearth. In addition was a sink with an earthenware cistern and tap, standing over a wooden tub. In the other room were the balances and some cupboards containing instruments." Such was one of the foremost quantitative laboratories of the year 1800.

FURTHER DISCOVERIES.

Sir Humphrey Davy had just discovered the anesthetic power of nitrous oxide "laughing gas," and was soon in the first decade of the century to startle the scientific world with the proclamation that soda is not an elementary substance, but a compound containing a silvery metal, which he called sodium, and that common salt, therefore, from which soda is made, is nothing but an ore of this metal. He was soon to discover, too, the intense light and heat of the electric arc, and thus pave the way for the invention of an instrument which in recent years is proving of vast value, both in the laboratory and in industry for attaining temperatures vastly higher than could be otherwise reached, viz., the electric furnace.

Michael Faraday, to whom both electricity and chemistry owe so much, was a boy of nine years, not yet apprenticed to the bookseller; and John Dalton, the founder of modern chemical theory,

although he had been from early youth engaged in recording all sorts of meteorological observations and speculating on their causes and meaning, had only just begun in his thirty-fourth year to experiment in chemical science, though his fame as the discoverer of color-blindness was already widespread. Dalton was more of a mathematician than most chemists have the good fortune to be, and in his youth had been a keen student of Newton's works. He was a firm believer in the old doctrine which Newton had tried to put on a scientific basis, that any piece of matter is not capable of infinite division, but that all substances consist of very tiny particles which cannot be further subdivided. His chemical determinations of the amounts of oxygen, nitrogen and water vapor present in the atmosphere strengthened his conviction of the correctness of this view, and led him at the same time to an appreciation of the fact that gases diffuse into each other, and to the assumption that the ultimate particles of different substances differ from each other not only in quality but in size. He at once sprang to the conclusion that, when two substances combine chemically, an atom of the one unites itself to an atom of the other, and, therefore, that the weights of two substances which combine represent the weights of their atoms. Thus was propounded by the self-taught Quaker in the dawn of the nineteenth century the theory concerning the ultimate constitution of matter, which, although it has since undergone several modifications, has had an inestimable influence upon the development of every department of natural science. For forty years thereafter Dalton lived his quiet life in Manchester, supporting himself mostly by private tuition, declining the offer of positions of emolument, laboring Ohm Hast, Ohm Rast, to establish his doctrine and estimate the relative weights of the ultimate particles of different substances. A good story is told of Dalton, which shows that he, at least, had broken away from the old medical school. Once suffering from a cold he called in a doctor, who ordered him a dose of some powder. Next day the patient was found to be better, and the delighted physician, as they will do still, at once attributed the improvement to his prescription. "I do not well see how that can be," said Dalton, "for I kept the powder until I could have an opportunity of analyzing it."

FROM THE MYSTIC EAST.

One often hears from students of the history of human thought, who have not studied so deeply the history of scientific development, that there is nothing much new in all this atomic theory, for the conception of an atomic structure of matter seems to be almost axiomatic and coeval with the dawn of speculation, for it is finally traceable to the mystic East. But to detractors we may answer in Dalton's own words, as he introduced himself to an Edinburgh audience in 1807: "I have been enabled to reduce a number of apparently anomalous facts to general laws, and to exhibit a new view of the first principles or elements of bodies and their combinations, which will produce the most important changes in the system of chemistry and reduce the

whole to a science of great simplicity intelligible to the meanest understanding." The atomic theory of deductive philosophers was due simply to the inability of the human mind to grasp the infinite; that of Dalton differed from it in essentials, and was besides founded on an eminently experimental basis. After the test of a hundred years we can truly say that his words showed only a right appreciation of the merits of his system, even if we remain sceptical about the extent of its intelligibility to the meanest intellect.

It is quite true that Leucippus and Democritus taught more than 400 years before the Christian era that vacuous space and moving atoms are the eternal and immutable existences, and that the atoms vary in size and weight. But they had no reason for the latter assumption except possibly the observation that some substances are denser than others. Dalton had his recently discovered laws of chemical combination by weight on which to base the modern atomic doctrine.

The first five years of the century saw the birth of three men who were destined to have as great an influence on the development of chemical philosophy as Cavendish, Lavoisier and Dalton had on its foundation. They were Graham, Wohler and Liebig. Graham's labors in the domain of pure chemistry were very restricted in scope, though of immense value. He devoted himself more to that interesting field which lies on the boundary between chemistry and physics. He, too, was of a mathematical bent, and we find him early speculating on some of the still unsolved problems of chemistry, such as the causes of the solubility of gases in water. His mind was all along engrossed with the conception of atoms and their everlasting motion, and we owe to him the discovery of the laws which regulate the velocity with which the ultimate particles or molecules, as we now call them, of one gas will penetrate between those of another to which it is exposed. Later, he investigated the phenomena attending the diffusion of solids in solution, and obtained many interesting results. His work on the diffusion of gases, along with that of Andrews and others, has since, in the hands of Clausius, Clerk, Maxwell, Helmholtz, Lord Kelvin and Van Laar, given us an almost complete kinetic theory of the molecules of gases.

Faraday, in the meantime, had shown that there is no essential difference in nature between the liquid and gaseous states of matter, but that many gaseous substances may be readily liquified by subjecting them to pressure and to a low temperature. He had also greatly advanced what is now known as electro-chemistry by his discovery of the simple relationship existing between the number of molecules of different substances which are decomposed when the same electric current is allowed to flow through their solutions.

PRACTICAL UTILITY RECOGNIZED.

Thus far chemistry had been studied as a pure science, and its bearing on the industries of the world had been only faintly appreciated, although we find many suggestions of the practical utility of their discoveries in the works of various writers.

Thus Priestley, the discoverer of oxygen gas, says of it: "The feeling of it to my lungs, when inhaled, was not sensibly different from that of common air; but I fancied that my breast felt particularly light and easy for some time afterwards. Perhaps we may infer from this that pure oxygen might be very useful as a medicine." Again, he found that on shaking up carbonic acid gas with water he obtained a "glass of exceedingly pleasant sparkling water which could hardly be distinguished from very good Pymont, or rather Seltzer water. "I doubt not, therefore," he says, "but that, by the help of a condensing engine, water might be much more highly impregnated with the virtues of the Pymont springs and it would not be difficult to contrive a method of doing it." It strikes one as curious, indeed, that no one should have thought it worth while to contrive a method of making artificial aerated water for such a long time afterwards, and that the carbonic acid gas, which is produced in such enormous quantities in breweries during the process of fermentation, should only have been employed for this purpose during the last few years, although that was the source from which Priestley obtained the gas which he used for his experiments in 1770. Unfortunately, the manufacturer has always, until recently at least, been slow to appreciate that the curios of the scientist can have any practical bearing, and, fortunately, there have always been scientists too absorbed in theoretical studies to waste much of their life's short span on the technical applications of their discoveries. It lies in the nature of things that an applied must follow in the rear of a theoretical science, and we have, but recently, awakened to the fact that technical advance must be more rapid the closer the practical business man keeps in touch with the scientist. It is almost exclusively to the business man's interest to do so, for full seldom is that share of the pecuniary reward meted out to the scientific discoverer, which is bestowed upon the successful candidate in other spheres of human endeavours.

With regard to many of the sister sciences, chemistry had occupied a position of mutual indebtedness, as must always be the case. Many of the methods and laws of physics were of great value in attacking chemical problems, and physicists had never been slow to make use of the vast number of new substances prepared for them by chemists. The biological world supplied the chemist with a store of material nowhere else to be found, which formed the subject of many an investigation. These substances, however, such as vinegar, alcohol, sugar, tartaric acid, fat and a host of others less familiar, were obtained as products of the vital processes of plant and animal life, and, although they were known to be built up of the same elements as are found in the mineral kingdom, their production was ascribed to a vital principle, modifying and rendering possible in living tissue chemical reactions, which never could be performed in the laboratory. This theory of a vital principle was universally accepted in the second decade of the past century; in fact, the Berlin Academy in 1800 awarded a prize for an essay, in which the author claimed to have proven by experiment that plants produce mineral matter even by their vital force.

WOHLER'S GREAT DISCOVERY.

The surprise of the scientific world was great, therefore, when Wohler announced his epoch-making discovery, that he had succeeded in producing from purely mineral matter a substance called urea, a substance which, up to that time, had been regarded as most characteristically due to the life processes of animals. This discovery of Wohler's, that the chemical changes taking place in the living organism are governed by the same laws as those of inanimate nature, was the dawn of a new era for plant and animal physiology, and laid the foundations of what is almost a new science, namely, physiological chemistry, the primary object of which is to determine what relationship the various chemical substances found in the living animal or plant bear to the separate organs and parts in which they occur, as well as the economy of the whole individual. Since that time many of the substances, whose formation was accredited to the vital principle, have been made in the chemical laboratory, and the advanced student learns how such complex compounds as alcohol, glycerine, fat and grape sugar can be made from charcoal and water. Some of these processes show promise of developing into great industries, and some discoveries in this same field have already done so. For example, the ordinary dye-stuff indigo, extracted from certain plants which have been cultivated in India for thousands of years, has now to compete with the same material "made in Germany." Much of our mustard never grew on a mustard plant; it wants but one link in the chain of synthesis to supply us with tea which never saw Ceylon or any other tea plantation; and soon we may be smoking delicious cigars imbued with nicotine and an aroma which they never drew from the soil or the air of the sunny south. This may sound imaginative, but the production of the coal tar dye alizarine in the laboratory has completely ruined what was at one time a staple industry of France, Holland, Italy and Turkey. These countries grew vast quantities of the madder plant, which has been used from time immemorial on account of the dye contained in its roots. Twenty years ago the annual import of it into England was valued at over \$6,000,000. Now all this is changed, and the whole of the alizarine which the calico printer requires is made in English and German factories.

DISCOVERY OF BENZINE.

Reference to these substances brings me naturally to the tremendous impetus given to industrial chemistry by the discovery of benzine by Faraday in 1825, and the fact that it and several substances closely resembling it are contained in the tarry liquid which is formed in the production of coal gas. The number of compounds which have been made from this black tarry stuff, disagreeable in odor and filthy in taste, is numbered by thousands of thousands. We have sweetness far beyond that of the honeycomb, the fragrance of the meadow-sweet, the violet, the geranium and the rose; the flavor of the vanilla, and the deadly juice of the hemlock and the belladonna. Besides all these the brilliancy and the variety of nature's tints, aye, even of the sunset and the dawn, are rivalled by the colors which have been

prepared from the quondam waste product of a great industry. Nor is this all; we have sulphonal to dull the exhausted brain to rest, antipyrine, phenacetine, antifebrine and a host of other drugs whose exact physiological value is possibly not yet quite understood, as well as the deadly lyddite, whose effect no man can misunderstand. The development which has taken place in these industries within fifty years is illustrated in the fact that aniline, which in 1856 cost \$5 a pound, can now be bought for 30c. The amount of wealth which has been made from them and the money still invested in them is enormous, but it is small, a drop in the bucket, in comparison with other industries which also owe their tremendous development during recent years to the labors of the research chemist. To enumerate these would be almost equivalent to counting up the various activities in which the human race is engaged, for I am able to think of none which have not either very directly or indirectly benefited thereby, but I may be allowed the time to mention a few. First, we might place the methods for the extraction of every metal from its ores but that these have been very recently taken over by the metallurgical department. However, a metallurgist must be a chemist. Then might follow the sulphuric acid, the soda and the bleaching powder industries, and through these, as well as directly, agriculture, spinning, photography and the manufacture of paper, soap, glass, pottery, cement, oil, sugar, starch, spirits, explosives and all kinds of electroplated ware. Turn where we will we can scarcely find a great industry which has not been brought to its present high state of perfection by the labors of the chemist.

SCIENTIFIC SIDE NOT NEGLECTED.

But, in the midst of this vast scientific development of industries, chemistry as a science was by no means lagging. After the atomic theory was established, its aim was to discover how many of these atoms are linked together to form the molecule of each particular compound, and the different properties of all substances were found to be due to the different numbers and kinds of atoms contained in their molecules. It soon became evident, however, that the postulate of difference in number and in kind of the atoms was not sufficient to account for the differences in properties of substances. The first discovery of this kind was due to a young chemist, whose name has long been a familiar household word, Justus von Liebig—a man to whom the human race probably owes more than to any other individual of the century. He could truly say of himself, *Homo sum, humani nihil a me alienum puto*, for he devoted his fervid talents during a long life to the service of his fellowman. He established the first school of chemistry at Giessen, where many of the notable chemists of the century received their training; he pointed out the simple chemical principles which underlie the art of cooking, investigated the effects of various kinds of food upon the human system, and thus gave an enormous impetus to the science of physiology; he founded the science of agricultural chemistry, establishing an experimental farm on the most barren

spot to be found near Giessen, which, in a few years, by scientific treatment, he changed into the most fertile plot in the district; he was the first to clearly enunciate that most beautiful of all nature's harmonies—the mutual dependence of the vegetable and animal kingdoms; he founded the science of pathology, and, although his views regarding the relation of micro-organisms to chemical changes were for many years held to be erroneous, in consequence of Pasteur's subsequent work in the same field, some recent researches have indicated the correctness of his opinion, that these changes may be due more to chemical substances produced by the micro-organisms than to the micro-organisms themselves; and, to close the long list of his life-work, he was a popular expounder of the fruits of his labors—he was the first university-extension lecturer. But to return from this digression to his early chemical work. As a boy he had seen a travelling showman dissolve a silver coin in nitric acid, and by adding to it a liquid that smelt like brandy, produce that terribly explosive powder which we now call silver fulminate. One of his first researches was to find out the nature of this explosive substance. He discovered, to his own surprise and the amazement of the chemical world, that it consisted of the same elements combined together in the same proportions as another very well-known and harmless compound—silver cyanate. At the time this was deemed incredible, but subsequent investigations have brought to light a vast store of facts of a similar nature. We now know many instances of two substances which contain the same number of atoms of the same kind joined together in their molecules, and hence it is necessary to assume that the atoms of the one substance form a different geometrical figure, or have a different arrangement in space from the atoms of the other. Starting with this assumption we should expect to find all manner of shades of difference in the properties of substances whose molecules contain the same number of the same atoms, according as the arrangements of the atoms differ more and more from each other—an expectation which is fully borne out by investigation.

AN UNANSWERED QUESTION.

This is a department of chemistry to which, I believe, physiology must look for an answer to that most mysterious of all biological problems: How can an apparently structureless germ bear in it all the qualities which determine the nature of the adult into which it will develop? It has been calculated that the smallest living object visible under the microscope cannot contain many more than one million organic molecules, and that, therefore, no physical arrangement is sufficient to account for the infinite variety of individuals and species which surround us. Recent chemical research has indicated, I do not say shown, that, to use this theory, a molecule consisting of even a few atoms may, when the relative position of these atoms is only faintly changed, undergo a slight change of one particular property, so that even a few atoms may be capable of a great number of arrangements differing but slightly from each other, and representing sub-

stances differing but slightly in properties; and I believe that, when we have discovered the means of examining more of their properties, such substances as albumen and protoplasm, whose molecules consist of hundreds, possibly thousands of atoms, will, when obtained from different individuals, be found to exhibit all manner of gradation of these properties according as the geometrical arrangement of the atoms of which they consist varies. Another physiological problem which must be solved by the chemist, and whose solution seems marvellously long delayed, although many attempts have been made in this direction, is the mechanism of the changes which occur when the green leaves of a plant, under the influence of sunlight absorb carbonic acid gas from the atmosphere, and give off oxygen gas.

Among the many marvellous achievements of the century none possibly appeal more to the imagination than the discovery of the method of comparing the elements found on this earth with those existing in the sun and other more distant heavenly bodies. The development of this field of research by means of the spectroscope is due more to astronomy and physics than to chemistry, but the crowning marvel of it is due to a chemist, Professor Ramsay. During a solar eclipse, when the disc of the sun is hidden from view, what appear like great flames shoot up from the surface of the sun to a height of 100,000 miles and more. When these are examined through the spectroscope a bright yellow line is seen indicating the presence of some gaseous body high up in the sun's atmosphere which emits that particular light. Now, at the time of this discovery, no terrestrial substance was known which gave a corresponding line in the spectrum, so the hypothetical gas was labelled Heilum, to mark its connection with the sun. About six years ago, however, Ramsay, in examining the small quantities of gas given off when several minerals are heated, found that many of them gave just this particular yellow line which had been observed in the solar spectrum twenty-five years before. And thus Helium, if not brought down from heaven to earth, afforded, at least, one more link in the long chain of evidence connecting the earth with a solar origin. Time will not permit me to do more than refer to the later brilliant work of Ramsay and Travers, on the new methods they have introduced into chemistry, and on the rare and interesting gases which they have found to exist in the atmosphere, except to remark that they have found Helium there also.

A CANADIAN'S WORK.

During the last quarter of a century a new instrument has been added to the equipment of the chemical laboratory which has already yielded many remarkable results, and gives promise of many more. To a Frenchman, Moissan, belongs the honour of having first used for a long series of experiments in which the heating power is the electric arc, and to a Canadian, Wilson, the credit of founding a great industry by the same agent. The temperature attainable by this means seems to be almost as far above that of the hottest furnace hitherto known as that is above the temperature of the human body. And, with

this unprecedented concentration of heat in a small space, substances are easily made to undergo changes formerly only suspected from analogy. Metals are made to melt and boil like water; carbon, one of the most refractory of all substances, apparently liquifies and changes into a gas; and even lime, which was formerly employed to withstand the highest temperatures attainable, melts like wax, and finally boils away, too, in the gaseous form. Chemical substances can be prepared by means of this intense heat which were formerly unknown, or beyond the skill of man to manufacture. Moissan has made diamonds, small, it is true, but still diamonds, and Wilson has brought to the market a new product of great value—calcium carbide.

It is a grey stony looking substance, made from lime and charcoal, and possesses the remarkable property of reacting chemically with water and giving off a gas called acetylene, which burns with a very brilliant flame, and so forms a very convenient illuminant. This is but one of the many valuable commercial articles prepared in the electric furnace. The metal aluminium is extracted from clay by means of it; phosphorus, used in making our lucifer matches, has been prepared in England by it for fourteen years; chrome steel, so hard that a shell tipped with it will pierce the thickest armor plate afloat, and carborundum, whose hardness makes it valuable in making all kinds of polishing and grinding machines, are also prepared in the electric furnace; and, lastly, potassium cyanide, now used in vast quantities in the gold fields and for electro-plating, is being produced in Scotland at a very low price by the same agent.

IMPORTANCE TO CANADA.

It is to industries such as these that Canada, with her enormous water, and therefore, cheap electric power, must look for a large share of her commercial development, and it is partly to supply trained chemists for such works as I have mentioned in this address that we have the magnificent chemical laboratories in this University. But I should like to say a word with all diffidence as to how we are to train them to take their share in the development of such industries. Is it by teaching them only a great number of scientific methods, so that when they leave us they may be able to perform automatically, or even with intelligence, the routine

duties in a manufactory or works? I think all my colleagues will agree with me in saying, emphatically, no. And herein, I think, lies the great advantage of the historical method in the teaching of science as a means of developing the reasoning powers, for by it the student is placed as far as possible in the mental position of each particular investigator, confronted with his puzzle, and shown how that difficulty was overcome. And, even this, I venture to think, is not sufficient. Every student ought to be himself confronted with a problem not yet solved, and compelled, under the guidance of his teacher, to use his own ingenuity for its solution. One aim of the technical teacher must be to train the student how to overcome the unforeseen difficulties that arise in industrial work, and by original investigation I think he will gain more than by a long-continued routine course.

But neither is this the ultimate ideal of university culture even in a faculty of applied science. Much has been said and written in recent days concerning the advantages of the new system of technical training in our universities over the old, when classics and philosophy held sway. The tendency, in the present generation, is to extol the new and depreciate the old, as was done by Lord Rosebery a few weeks ago, if I read him aright, in his inaugural address to the students of Glasgow, while the conservative mind sees nothing in modern teaching but the production of skilled labor. I would reply to both that the highest culture is to be won not from the subject, but from the method of study. We have all known men of deep philosophic spirit who had studied little beyond Shakespeare and the Bible, and others equally philosophic, of scientific bent, who had never read Virgil or Homer. Let us remember in our purely technical teaching that all those things tend only to the amelioration of the present physical conditions of part of the human race; in other words, to improve the quality of its bread and butter and the fineness of its coat. It is surely our duty to instill into the minds of our students the thought that there is a philosophy of science, that science rightly considered is the attempt of finite mind to read and express in its poor language the unquestionable writings of an infinitely creative intelligence. Is it not written, "Man shall not live by bread alone, but by every word that proceedeth out of the mouth of God?"



Societies.

UNDERGRADUATES' LITERARY.

Very important business was gone through at a special meeting of the Literary last Friday. Before Christmas Geo. Irving, Arts '02, and Chas. Ogden, Law '02, had been chosen as McGill's representatives for the McGill-'Varsity debate, to take place in the Molson Hall on February 1, 1901. The Toronto men who will come down this year are Messrs. Fisher and Wilcox. Chas. Ogden tendered his resignation as speaker, and the meeting accepted it. A committee of five was then elected to see that a proper reception be tendered the 'Varsity delegate, and the following were chosen: Chauncey Adams, '02, H. S. Williams, '01, W. S. Johnson, '03, A. Wainwright, '02, and R. Harper, '01.

The secretary communicated an important letter from Queen's, inviting McGill to an Inter-University debate to take place. After considerable discussion the invitation was accepted, and the committee who chose speakers for the 'Varsity debate were instructed to choose men for the coming debate.

Owing to the Arts' Conversari, next Friday, the Society adjourned to January 25, when the Sophomore and Freshmen Years will meet in the time-honoured annual debate.

MEDICAL SOCIETY.

Montreal, Jan. 11, 1901.

The first meeting of the Medical Society for the New Year and the New Century was held to-night (Friday), but, owing to the season of the year and inclemency of the weather, was not very largely attended. After the reading of the minutes and the settlement of business, Mr. A. C. P. Howard, B.A., '01, read a very excellent and interesting paper on "Malaria, its Etiology, Recognition and Treatment." Another paper was to have been read by Mr. E. G. Mason, but owing to illness he was unable to be present. After some discussion on the paper read the meeting adjourned.

Y. W. C. A.

The first meeting of the Y. W. C. A. was held on Wednesday, Jan. 9. There was a good attendance of Undergraduates of all Years. The Meeting was conducted by Miss Gass.

Y. M. C. A.

McGill is to have a visit this week from one whose name will ever be linked with the history of the civilization of China. Dr. and Mrs. F. Howard Taylor are coming here in the interests of The Student Volunteer Movement for Foreign Missions. Dr. Taylor is the son of the Rev. J. Hudson Taylor, the founder of the China Inland Mission. He received his degree from London University, and is a member of the Royal College of Physicians of London and a Fellow of the Royal College of Surgeons of England. He has spent ten years in an inland province of China, where he was the only physician among fifteen millions of people.

Mrs. Taylor was Miss Geraldine Guinness, and is well known as the author of "In the Far East" and other standard missionary volumes.

They are both speakers of rare ability and are eminently qualified from their experience to speak about medical missions.

Dr. and Mrs. Taylor are accompanied by Mr. C. K. Roys, of College of Physicians and Surgeons, New York City.

Dr. Taylor will address the medical students in No. III Lecture Theatre, Medical building, on Sunday at 3 p.m. It is also expected that Mrs. Taylor will speak at that meeting.

Mr. J. Leslie Tedford will sing.

Dr. F. G. Finley, President of the McGill Medical Society, will preside.

Mrs. Taylor will address the Donalds in the Royal Victoria College at 4 p.m. on Sunday.



Class Reports.

ARTS.

1901.

Our two South Africans, Capt. Ross and Lieutenant McCormick, have now both returned, the latter having arrived during the Christmas vacation. Those of us with medical tendencies expect to have McCormick for a Class mate again in Med. '05.

The century fiend is still out; only this week Biddy was heard giving "My reasons for stating that the century began last year."

A man to be religiously shunned is he who wishes you a Happy New Year and then touches you for a dollar for the OUTLOOK.

Daisy hasn't got over that third in French yet. Never mind, Harry, Maxime would have given you a first.

Anybody within a radius of twenty feet of "Almighty Voice" in philosophy can make a safe hit as to where that shining light spent the hour previous. We fall back respectfully on either side as it advances into the class—a draughty personification of a good, healthy, up-to-date dissecting room.

All up for the Conversat.

GLADYS GAY'S HEART TO HEART TALKS.

(Inquiries should be sent in one week before publication.)

W. G. M.—It is unwise to give advice to anyone in love, no matter how experienced you may be. I am afraid from the tone of your letter that you are somewhat of a coquette. You should try and be more serious. Be careful or you may break someone's heart.

Norval.—I could not make out your note. With regard to your writing I should say that you needed practice. You can obtain this by attending Dr. Murray's lectures.

L. Indsay.—It is not customary to be engaged more than once, but, no doubt, with your attractions, you may have found this a difficult rule to observe.

Chippie.—Do not be discouraged because people do not understand your poems. Many people fail to understand Browning.

Student.—No, it is not proper for students to give diamond necklaces to young ladies. (b) You can give your hair the desired colour by applying Diamond Dyes once a week.

Arthur.—The proper dress for a theologian is a black, broad-brimmed soft felt hat, black suit, white necktie and tan shoes. He should preserve a humble manner to all, especially to those below him.

R. Usher.—Long walks before meals are very healthy.

G. D. F.—However much more than the Professor you may know about the work you should unselfishly allow him to imagine that he knows something.

Biddy.—I should say that loud checks or stripes in some light colour would suit your particular type of beauty. Yes, if you are going into law it is advisable for you to talk as much as possible in order to acquire confidence in yourself.

X. X.—The fact that your young man turns down the gas when he comes to see you indicates that he is careful and economizing. He is likely, however, to be of a close and grasping disposition.

1902.

The beginning of a new century has been eagerly seized upon by certain members of the Year as an opportune moment for the making of good (but not by any means new) resolutions; in other words, for the turning over of a new leaf, which will certainly be an improvement, at least, as far as some of the Theologs. are concerned.

Bill has decided to quit sw - - ring!

Br-d-e will be more careful of his health, and work less.

Pl-nt has thrown Shelley over in favour of Goethe.

McD-n-ld has forsworn dancing.

Uncle John will "never smile again."

M-rphy has begun to work for a change.

Irv ng has learnt "to see himself as others see him," and has, accordingly, decided that he was not intended for an orator.

Member of Conversat. Committee to Student:—
"Will you buy a ticket for the Conversat.?"

Pl-nt.—"Does that include a lady's ticket?"

M. C. C.—"Yes."

P.—"What if you wish to take two?"

1903.

The joyful reunion of our members, many of whom had not seen one another since last century, was only marred by one thing. Our dear friend and fellow comrade was absent. M-K-l-r was a minus quantity.

The following pastoral has been received at our office. Its author is unknown, and, owing to the imperfect state of the MSS., there has been much speculation among the literary men of the city as to whom it refers to:—

Quis Est?

They took him from the farm-yard and the plough,
They dressed him in his store clothes, black and neat,
His black fedora placed they on his brow
And shiny city shoes upon his feet.
They sent him up to town, to "Old McGill,"
And, as he left, they whispered in his ear:—
"Don't stay out late at night,
"Don't join in any fight,
"And never, never touch a drop of beer,"

Oh, —————
 You're a rare 'un, heart and hand,
 You're a credit to your College and to all your native
 land.
 May your pen grow never rusty,
 May your poems ever sell;
 God bless you, —————,
 May you never land in ———.

SOME ANIMALS I HAVE KNOWN.

(Continued.)

The Water Jonsing. This great amphibious hydro-ped is the only one of the marine monsters which unites the characteristics of fish, flesh and fowl. It has been called by some the water-bat, and it certainly has a decidedly batty appearance, but, on closer examination, it is found to be more like a lobster than a bat.

Its fowl aspect, united with its fishy look, gives it an extremely wierd appearance, which is heightened by a pair of goggles that grow on the top and sides of its beak.

Its chief article of diet is water, but it is partial to an occasional B. & S. (beans and salt). It is very fond of the Nicotina plant, but tries to hide this from the other beasts; in fact, it endeavours to be a model for all animals, and just as the Sparkins is called the king of beasts, so the Water Jonsing has been described as the clergyman of vertebrates.

DONALDAS.

1901.

At a meeting of the Fourth Year, held before Christmas, Miss Page was elected Valedictorian for the Donaldas.

1904.

Students of this Year returned in force on Monday, full of good resolutions concerning their work for the new term.

We are pleased to welcome Miss Griffin to our ranks after an absence of six weeks.

Lost, during last century, from the Select Cloak-Room, a pair of running shoes, price eighty cents. Finder will please return them as soon as possible to above address, as the owner cannot afford to lose them.

MEDICINE.

1901.

Our prospective special clinics are aimed to prevent any lazy habits developing in our Year. They take the place of the 8 o'clock lecture.

All busy writing up old and new case reports and some of the Xmas fattening is beginning to disappear.

Dan McK— and John C— had a very interesting time at Maternity Saturday night.

McPher— and Jimmy W— and Dan McK— changed places this term with sore hearts.

New-time table out. All are happy to begin New Year free from 8 o'clock lectures.

Ned S—, owing to cold winds, has dispensed with his side-boards.

Dick Tay— got a C. E. calendar for a Xmas present and has made many New Year resolutions accordingly.

Jimmy Roberts is working harder than usual, and will endeavour to continue at work and cease his frivolity.

1903.

We are pleased to report "Jack" Andrews with us again after a somewhat dangerous illness.

All the boys are on hand again after Xmas holidays. Many spent part of them in the dissecting room when the temperature permitted.

The classical allusion, "Beware the Ides of March," comes on us with its fullest meaning this term.

We regret that Mr. Jno. McGeachy has been compelled to return home for a time. John was appreciated most by those who best knew him.

Tommy Mac —, our hockey organizer, led a team across the mountain last week. For full particulars ask Scove.

Various opinions prevail with regard to the "Early Closing Act."

1904.

Nothing has happened worthy of note since the holidays. Your reporter, unlike many of his colleagues, not being possessed of the happy faculty of writing about nothing, craves the assistance of the other members of the class in the weekly publications.

By the way! something has happened. The casualties of the fatal battle of Dec. 18 have been made known. We rejoice to know that so few were slain. Our sympathies are profoundly with the "sick and wounded." May they receive good treatment from those whose duty it is to apply the healing balm.

REVUE LÉGALE.

A Happy New Year to all our readers, especially to those who are obliged to work a weekly joke-mill. The new century has brought higher spheres of activity to some, but "ye Reporter" has still to report things that never happen and jokes that are at least a week old. The only solution of the difficulty is for the Governors to take over the management of the OUTLOOK retaining a promising young journalist (far be it from us to hint) to conduct it and to publish a daily edition. Just as few men would subscribe for a *daily* as for a *weekly*, and it would have several other advantages which our present publication lacks.

At the opening lecture—"Gentlemen, I wish you all a Happy New Year; may the examinations be as easy as is good for you."

Wouldn't that pluck you?

Whispers from the back benches—1st Eager learner "What is a *cloture de ligne*?"

2nd Learner—"A clothes line of course."

"This is an important principle, gentlemen, arising from the still more important principle that there is no rule of law which deprives one of the right to pay another's debts."

There is some reason in law after all.

"The present article was enacted to prevent useless and expensive litigation and has, thereby, conferred a great benefit on the community."

It is strange how one's point of view changes when one is no longer spurred on by the mere lust of fees.

There are some strange rules in the Merchants' Shipping Act. It is most immoral to send a ship to sea *tight*. No wonder the poor thing rolls.

DO IT WELL!

We clip the following from *Success* as an anecdote eminently illustrative of our late Principal's character:

Half a century ago a college student was appointed to survey a tract of "crown land" in eastern Nova Scotia—a barren region about fifty miles long and thirty wide, strewn with granite boulders and traversable only on foot or with a very steady steed. The soil was not fertile, the timber was not marketable, and the land was so nearly valueless that only a rough survey was expected, there being no likelihood that the measurements would ever be tested or the lines run over again.

But that student handled his chain and compass as if all his work would be tested by the eye of Omniscience. *Wouldn't it?*

Ten years ago, in that whole area of thirteen hundred and fifty square miles, there were but twenty-six residents, some of them not permanent.

But gold was discovered there, with vertical "leads," making fortunes depend upon the accuracy of surveyors' conclusions. Experts with transits and theodolites tramped and retramped over the whole territory to locate to a hair's breadth the most nearly perpendicular veins. But, after all, their most careful tracing and computing, the government's finest surveyors declared that their work was unnecessary, as every one of the college students' lines proved true to the human limit of perfection.

But did the student rise? Of course, he did. The only permanent way to keep such a youth down is to bury him. He is known now as Sir William Dawson, and is rounding out a grand, long life at McGill University, Montreal, Canada.—*Success*.

SIREN VOICES.

I hear Their voices, silver-sweet, me calling,
Clear-toned as bells upon a silent sea—
While in my heart the echoes rising, falling,
Sing of a refuge from my mi-ery,
List to the song that from Their lips is welling
In one long thread of soundful melody,
List to the tale, Their joyous voices telling
Of Love and Rest through all Eternity.

Why should I struggle 'gainst Life's storm arising?
Why toil with body racked and soul oppressed?
Are They not calling, in Their hearts devising
All joys for me when in Their arms crossed?
Those are not rocks on which They are reclining—
But fairy islets in green verdure dressed;
Those are not serpents round Their feet entwining—
But only shadows of the tree's unrest.

F. W. EXOL.

IN MEMORIAM.

'Tis melancholy—ah—to "once have been,"
To have known friendship and to meet with wrath;
But surely this is anguish still more keen,
To *have* had beefsteak—and to come to broth.

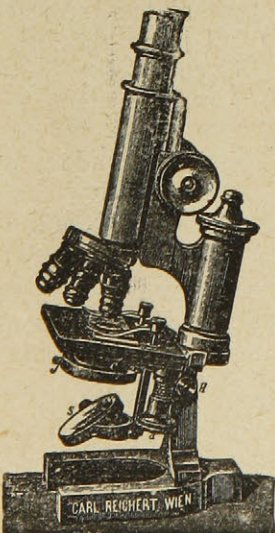
'Tis bitter to be great and then to fall,
'Tis hard to lose a well-requited post;
But oh, methinks 'tis saddest of them all,
To *have* had turkey—and to come to toast.

'Tis mournful to have loved and then to lose,
And having ruled 'tis hard to have to stoop;
But to the spirit, this the sorest bruise,
Once having salmon—to descend to soup.

And having been a king 'tis hard to serve,
'Tis sad for him whose income quickly drops;
But oh, it racks each palpitating nerve,
To *have* had bacon—and to come to slops.

Men pity him whose days once brighter ran,
And weep for him who sackcloth wears for silk,
But spare your deepest sorrow for the man
Who *once* had trifle—and who now has milk.

THE STUDENT.



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LADY "BOBS" AND HER TRUNKS.

That is a pretty story about Lady Roberts and her trunks, and men returning from South Africa vouch for its truth, says the "Westminster Gazette." At the height of the transport difficulties, in the teeth of the officials, she carried eight large trunks from Cape Town to Bloemfontein. Everyone wondered, everyone murmured. No one but Lady Robert could have got the things through. The transport of stores had been stopped for the time, the sick lacked every comfort, and those who were not sick were half-starved and half-clothed. Therefore, when a fatigue party was told off to fetch those eight trunks from Bloemfontein station things were said probably about the "plague of women."

But next day seven of the trunks were unpacked, and their contents distributed amongst the Tommies. The clever lady had snapped her fingers at red tape and smuggled comforts through to the men in this way. One small trunk contained her kit.

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At 15 Phillips Square, "My Valet" shows to the world a neat plate glass front, and behind is a veritable charitable institution to the bachelor student, who finds himself "a stranger in a strange land."

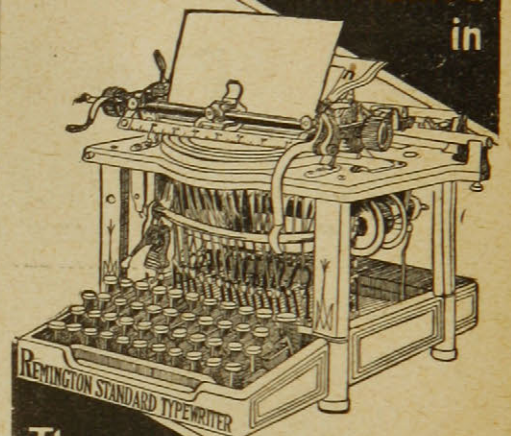
Of yore, he had to have recourse to his landlady's tender mercies, or better still, to her pretty daughter's, but now, when his clothes need mending, pressing, or cleaning, a telephone to "My Valet" and in a few minutes the clothes are sent for, and returned shortly afterwards, all in good order. It makes the mouths of the old boys water, just to hear of it.

De Wolfe Hopper, or "Will" as he is called by those who have the honor of knowing him well, strives to be a comedian off the stage as well as on. Indeed some people have been rude enough to remark that if he would be as quick and witty before the public as he is in private life, he would not have been obliged to play at a burlesque house but would still have been heading his own opera company.

But the post prandial wit sometimes comes to grief and when he flies too near a shining light he falls like Icarus of old, into a cold wet sea of mirth at his own expense. Mr. Hopper can be found almost any evening at the Lambs Club. He jollies every one he can find and seldom permits any one to get back at him. But he missed the other night, so the story goes:

A certain lawyer from San Francisco, Joseph Redding by name, is a frequenter of the club when in New York, and last Sunday evening he was present. Mr. Redding is also a pianist and when Mr. Hopper introduced him as a speaker the comedian remarked: "And now we will hear from Mr. Joseph Redding—a distinguished musician among lawyers and a famous lawyer among musicians."

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The laugh went around as usual whenever Mr. Hopper speaks, but it did not please the gentleman from the Golden Gate. Bowing to the tall actor he said blandly:

"No doubt you have all been so far along in your Latin studies as to read the opening paragraph of Julius Caesar's historical narrative. 'All Gaul' wrote Caesar, 'is divided into three parts.' Permit me to interject, that however much we may admire Caesar's literary style, we are forced to the conclusion that the gentleman has tampered with facts. Mr. Hopper stands intact before you."

And Will Hopper had nothing to say for the remainder of the evening. It was painful but true.

Some years ago in London, Mme. Sarah Bernhardt was the recipient of an opal and emerald pendent from Miss Olga Nethersole, who presented it to the great artist as a proof of her admiration and her affection. Mme. Bernhardt wore the jewel for some time, until a series of misfortunes, culminating in a serious illness, induced her to lay aside the charm. When the two distinguished ladies met in Miss Nethersole's dressing room at Wallack's Theatre the other evening, Mme. Bernhardt triumphantly drew Miss Nethersole's attention to the fact that she was again wearing the opal, and laughingly declared that she could now wear it with perfect safety since she believed that she had completely vanquished all her misfortunes. Thus it is seen that the greatest artistes are not superior to superstitious belief.

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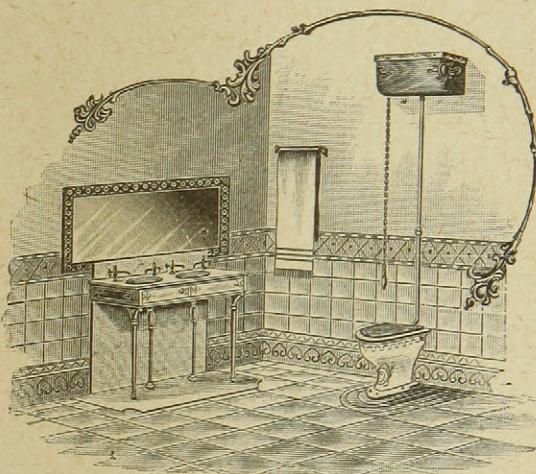
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